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**Gray's
Reef**



From the Sanctuary Manager

In 1999 we initiated the process of reviewing the management plan for Gray's Reef National Marine Sanctuary. We hosted a series of public meetings and received comments from the public and constituents of the sanctuary expressing their views on issues of research, education and resource protection at Gray's Reef. During the comment period approximately 1800 people participated to express concerns and provide recommendations. Many people asked that the Gray's Reef staff prepare a report on the current status of the sanctuary to use as a basis for continued discussions and to guide appropriate recommendations in the revised management plan. This report has been prepared for that purpose and discusses our state of knowledge and environmental health of this diverse and complex live bottom ecosystem off the Georgia coast.

*With this report as a starting point it is our hope that continued interest and guidance from the public will help shape the directions in revising the sanctuary management plan. It is also our hope that this overview of the sanctuary will encourage you to learn more and become involved in **shaping the future** management of this national treasure. We solicit your comments, concerns and recommendations at any time. On behalf of the sanctuary staff and advisory council, I thank you for your cooperation and assistance.*

Reed Bohne, Sanctuary Manager

National Marine Sanctuary Program Goals and Objectives

National Marine Sanctuaries are administered by the National Oceanic and Atmospheric Administration (NOAA). *The mission of NOAA's National Marine Sanctuary Program is to serve as the trustee for the nation's system of marine protected areas and to conserve, protect and enhance their biodiversity, ecological integrity and cultural legacy. The primary objective of each marine sanctuary is resource protection.* Each marine sanctuary is:

- to support, promote, and coordinate scientific research on, and monitoring of, the resources of these marine areas;
- to enhance public awareness, understanding, appreciation, and wise use of the marine environment;
- to facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas; and;
- to maintain, restore, and enhance living resources by providing places for species that depend upon these marine areas to survive and propagate.

In 1872 the United States established its first national park at Yellowstone. One hundred years later Congress passed the National Marine Sanctuaries Act establishing authority to protect the Nation's most valued marine areas. Today there are 13 national marine sanctuaries found in the coastal and offshore waters off the continental United States, Hawaii and American Samoa. They are the marine equivalent in size and biological diversity to our great terrestrial parks like Yosemite, Yellowstone and the Great Smoky Mountains. These sites range in size from the one-quarter square mile sanctuary in American Samoa to the 5,000 square mile Monterey Bay sanctuary off central California.

Gray's Reef: A National Treasure

Gray's Reef is truly a national and international treasure. Gray's Reef, designated in 1981, was the fourth national marine sanctuary. Five years later its value as a unique bioregion was recognized by the United Nations and was listed as an International Biosphere Reserve. Recently the South Atlantic Fishery Management Council designated Gray's Reef as a Habitat Area of Particular Concern in the Coral, Coral Reefs, and Live/Hard Bottom Habitat Fishery Management Plan. The Council noted that Gray's Reef has unique biological and ecological values, that it is a habitat of particular scientific interest, and is an area of great interest to sport fishermen and divers. In 1998 and 1999, the National Geographic Society profiled Gray's Reef in their magazine and through a special exploration of the sanctuary as part of the Sustainable Seas Expedition. National Public Radio, in partnership with National Geographic, also launched a radio expedition to the sanctuary to explore its ancient paleoecological past.

Gray's Reef is the only natural area protected off the Georgia coast. Consider the number and variety of terrestrial parks, refuges and protected areas along the Georgia barrier islands and coast. A similar ethic for marine areas is evolving. The 17 square miles of Gray's Reef constitutes a tiny percentage of the ocean space off the coast, yet its value as a natural marine habitat is expressed through National and International recognition. Why is this area so important?

Gray's Reef lies about 17 nautical miles offshore of Sapelo Island, Georgia at the margin of the inner- and mid-shelf of the South Atlantic Bight, a broad shelf area along the indentation or bight of the southeast coast of North America. The 17 square nautical mile boundary of the sanctuary encompasses the rocky features and sandy bottom of the seabed and its overlying waters. An intermittent series of rock ledges and sand expanses has formed a complex habitat of burrows, troughs, and overhangs. This habitat is optimal for the colonization of marine invertebrates, including sponges and corals, that in turn attracts a rich assemblage of reef and pelagic fishes, sea turtles and marine mammals.

This rocky substrate with its carpet of attached organisms, is known as a "live bottom habitat." Algae and invertebrates grow on the exposed rock surfaces. Sponges, barnacles, fan corals, hard corals, sea stars, crabs, lobsters, snails, and shrimp compete for space and food on the reef. Accordingly the reef attracts numerous bottom-dwelling and mid-water fish species, including sea bass, snapper, grouper, mackerel, and their prey.

photo by Gray's Reef

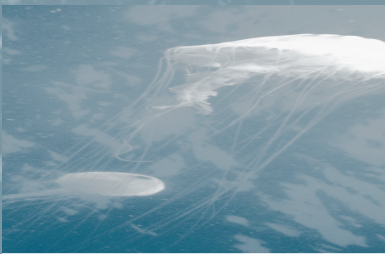


photo by Gray's Reef

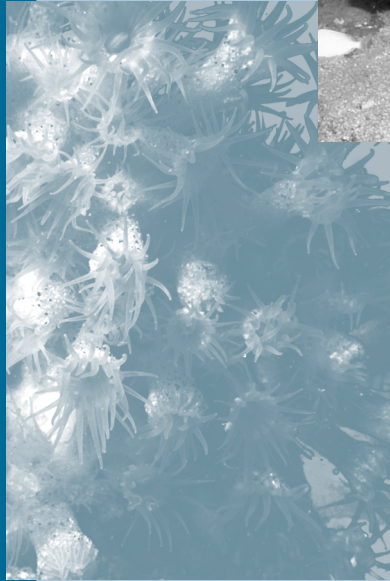


photo by Gray's Reef



photo by Karen Angle



photo by New England Aquarium

Sand areas between the reef features also provide habitat and food for fishes and invertebrates. Soft-bottom animal communities include flatfishes, clams, snails, bristle worms, sand dollars and other echinoderms, and a wide array of other species. Many reef fishes actively forage out on the surrounding sand flats. Waters overlying the reef also provide an important habitat for larval animals and for plants and animals which spend their whole lives afloat.

Gray's Reef lies in a transition area between temperate and tropical waters. Some reef fish populations and seaweeds change seasonally, while others are year-round residents. Migratory fish move through the sanctuary, feasting on the reef's bounty. Loggerhead sea turtles, a threatened species, use Gray's Reef for foraging and resting. The reef is close to the only known winter calving ground for the highly endangered northern right whale.

Gray's Reef may have been a site of ancient human settlement during the last geologic time period when sea levels were low enough to permit human habitation. Fossil oysters and snails embedded on the sandstone at Gray's Reef indicate that the reef was once a shallow coastal environment. Mammal bone fragments, including mastodon bone, found at the reef may demonstrate that it was exposed land as recently as 10,000 years ago. Gray's Reef, may even hide evidence of ancient Paleo-indian tribes buried in its sediments.

High Standards of Marine Conservation

National marine sanctuaries are designed to establish the standards for conservation of natural areas and cultural resources in the marine environment. The protection of these areas is the highest priority for marine sanctuaries. When Gray's Reef National Marine Sanctuary was established in 1981, the designation was signed by President Carter for the purpose of:

- resource protection top priority
- promote scientific research
- increase public awareness
- enhance living resources
- protecting the quality of this unique and fragile ecological community;
- promoting scientific understanding of this live bottom ecosystem, and
- enhancing public awareness and wise use of this significant regional resource.



To meet this standard in 1981, it was determined that the following activities should be prohibited to prevent degradation of the sanctuary environment:

- (1) Dredging, drilling, or otherwise altering the seabed in any way nor constructing any structure other than a navigation aid.
- (2) Discharging or depositing any material or other matter except:
 - (i) Fish or parts, bait, and chumming materials;
 - (ii) Effluent from marine sanitation devices; and
 - (iii) Vessel cooling waters.
- (3) Operating a watercraft other than in accordance with the Federal rules and regulations that would apply if there were no sanctuary.
- (4) Using, placing, or possessing wire fish traps.
- (5) Using a bottom trawl, specimen dredge, or similar vessel-towed bottom sampling device.
- (6) Altering by:
 - (i) Breaking, cutting, or similarly damaging, taking, or removing any bottom formation, marine invertebrate, or marine plant.
 - (ii) Taking any tropical fish.
 - (iii) Using poisons, electric charges, explosives, or similar methods to take any marine animal not otherwise prohibited to be taken.
 - (iiii) There shall be a rebuttable presumption that any bottom formation, marine invertebrate, tropical fish, marine plant, or marine animal found in the possession of a person within the sanctuary have been collected within or removed from the sanctuary.
- (7) Tampering with, damaging, or removing any historic or cultural resources.



photo by Gray's Reef



At the time of sanctuary designation there were no special restrictions placed on anchoring on the reef, midwater trawling, longline fishing or hook and line fishing. Spearfishing with powerheads is prohibited in the sanctuary, but spearfishing with other equipment is not. Regulations, implemented by NOAA's National Marine Fisheries Service (NMFS), governing these types of fishing activities at Gray's Reef are the same as those in effect for all offshore waters from 3-200 miles from North Carolina to the

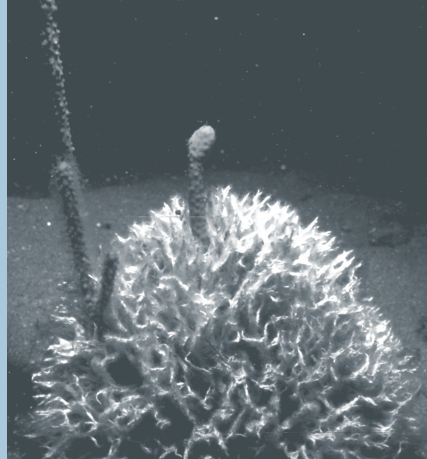


photo by Gray's Reef

photo by Passage Productions



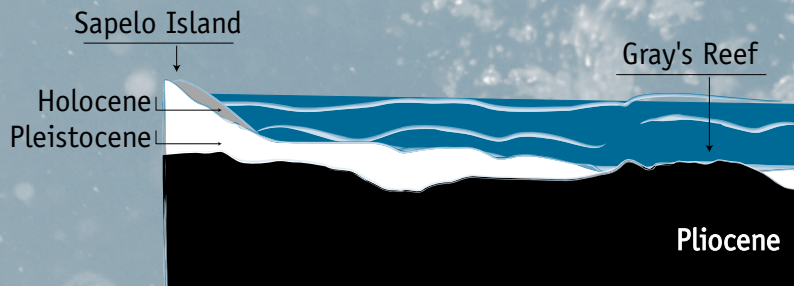
Florida Keys. In the nearly 20 years since sanctuary designation, the South Atlantic Fishery Management Council has proposed to NMFS new fishing conservation measures for the region and those adopted regionwide have also applied to Gray's Reef. To further emphasize the importance of the habitat in Gray's Reef and the need to continue protection of these habitats, the Council designated habitat in Gray's Reef as Essential Fish Habitat and Gray's Reef as an Essential Fish Habitat Area of Particular Concern for a number of species under regional management.

Over the same period Congress has amended the Marine Sanctuaries Act five times, strengthening the conservation principles for the program. On May 26, 2000, President Clinton issued an Executive Order directing NOAA to "take appropriate action to enhance or expand protection of existing marine protected areas and establish or recommend, as appropriate, new marine protected areas."

The ongoing review and revision of the Gray's Reef Management Plan will reflect these changes in marine conservation and the appreciation of such areas by a wider audience of scientists, educators and the public. The Management Plan will consider whether the existing conservation measures adopted for the sanctuary in 1981 should be revised to better reflect the current demands on the natural resources and alignment with the sanctuary mission to conserve, protect and enhance the biodiversity, ecological integrity and cultural legacy of Gray's Reef.

A Unique Marine Habitat

Gray's Reef is a small but very important part of the broad continental shelf off the southeast coast known as the South Atlantic Bight. The South Atlantic Bight extends from Cape Hatteras, North Carolina to Cape Canaveral, Florida. The outer reaches are dominated by the Gulf Stream flowing northeastward. The inner area is defined by the curve of the coastline between the two capes, and is dominated by tidal currents, river runoff, local winds, and seasonal storms, hurricanes and atmospheric changes. While Gray's Reef lies in the inner-shelf zone of the South Atlantic Bight, which causes greater seasonal variations in temperature, salinity, and water clarity, it is also influenced by the Gulf Stream. The Gulf Stream draws deep nutrient-rich water to the region and carries and supports many of the tropical fish species and other animals found in the sanctuary. Ocean currents transport fish and invertebrate eggs and larvae from other areas, linking this special place to reefs both north and south.



According to a recent study, within the area that has been surveyed from North Carolina to the Florida Keys out to the 200-meter depth contour, 39% is hard bottom or possible hard bottom habitat. Over 70% of the area has not been surveyed so these percentages represent only a third of the possible shelf area in this region. This study is valuable in showing how little of the seabed has been surveyed. Gray's Reef however is one of the most intensely surveyed live bottom features in the region. The sanctuary and other live bottom areas provide the solid foundation needed by marine invertebrate communities to attach and grow, feeding in the nutrient rich waters flowing from the coastal rivers or upwelling over the continental shelf from the deep ocean. Live bottom areas are essential habitat for snappers, groupers and other reef fish species, as well as important habitat for larger invertebrates, sea turtles and sea birds.

Ancient reef

The ledges and patch reefs at the sanctuary are composed of marine sediments (mud, sand, shells) that were deposited during the Pliocene Epoch between 2-3 million years ago. These marine sediments were consolidated into rock during subsequent glacial periods by numerous changes in sea level that repeatedly exposed, then submerged, the area of Gray's Reef as the coastline advanced and retreated across the continental shelf. It is estimated that Gray's Reef was a terrestrial environment as recently as 10,000 years ago. In fact, Gray's Reef may have been a site of ancient human settlement during that time and thus may contain important information that will contribute to our understanding of ancient cultures and the human history of the southeast coast. At the sanctuary, scientific divers have turned up fossils of now extinct land-dwelling animals, such as ground sloth, mastodons, early camels, horses and bison. Research on these fossils is expanding our general understanding of the ecology of the now-drowned coastal plain of Georgia.

These fossils may be associated with early human groups colonizing the North American continent in the late Ice Age. Many of the fossil finds are known prey species of these early human hunters. One antler fragment recovered at Gray's Reef shows possible evidence of human use as a tool.

- *part of the South Atlantic Bight region*
- *ancient reef*
- *dynamic environment*
- *nutrient rich waters*
- *diverse reef creatures*

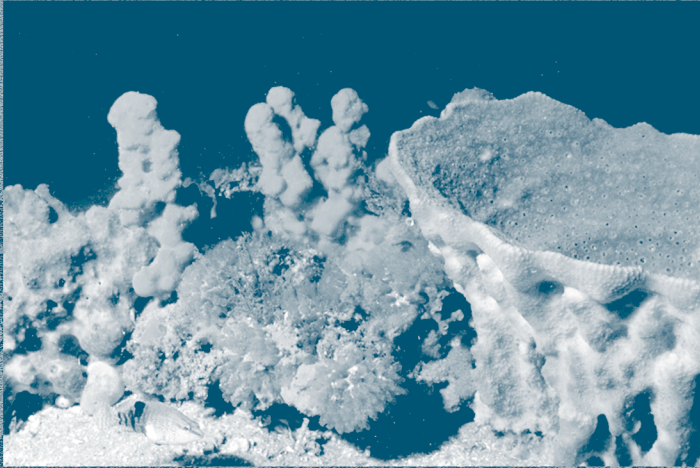


photo by Gray's Reef

A dynamic environment

The hard bottom features of the sanctuary are extensive, but patchy, in distribution. They can vary from very low relief, almost flat, sparsely populated emergent rock features, to 6-10 foot rock ledges densely colonized by encrusting marine life and populated by fishes. The rocky outcroppings and ledges are often separated by wide expanses of sand. The available live bottom habitat is subject to burial and exposure from shifting sediments driven by storms and strong tidally-influenced currents that may run up to two knots across the bottom. The weathering and bioerosion of the rock ledges may result in slumping and collapse of these features. The constant change in the environment creates a very complex habitat of caves, burrows, troughs and overhangs which supports about 150 species of fish, 200 species of invertebrates and 65 species of seaweeds.

Productive waters

The productivity of the diverse invertebrate communities of Gray's Reef is likely maintained by the intrusion of deep nutrient-rich waters of the Gulf Stream onto the shelf combined with the ingress of the drifting larvae of invertebrates and fishes from ocean currents originating in the Caribbean and Gulf of Mexico. This promotes periodic phytoplankton blooms which fix nutrients to be captured by the reef community. Additional nutrients and contaminants may be transported from land across the inner shelf, but this source of material is probably limited given the trapping efficiency of southeastern saltmarsh estuaries. The concentration of nutrients in the water will not only vary with intrusion events, but will also vary with the rates of exchange of nutrients between the water and sediments. However, the atmosphere is the major pathway of materials such as heavy metals, organic compounds, and nutrients to the reef. Fortunately, the levels of contaminants from such sources appear to be insignificant at Gray's Reef based on regional water quality assessments.

Seaweeds

Gray's Reef is a precarious habitat for seaweeds. Shifting sediments occasionally cover the rock on which the seaweeds grow. Suspended sediments can obscure much of the light required for growth, and temperatures fluctuate with the seasons. In addition to these physical restrictions, there is competition for space with other organisms and grazing by herbivorous animals, such as fish and invertebrates. Nonetheless, 65

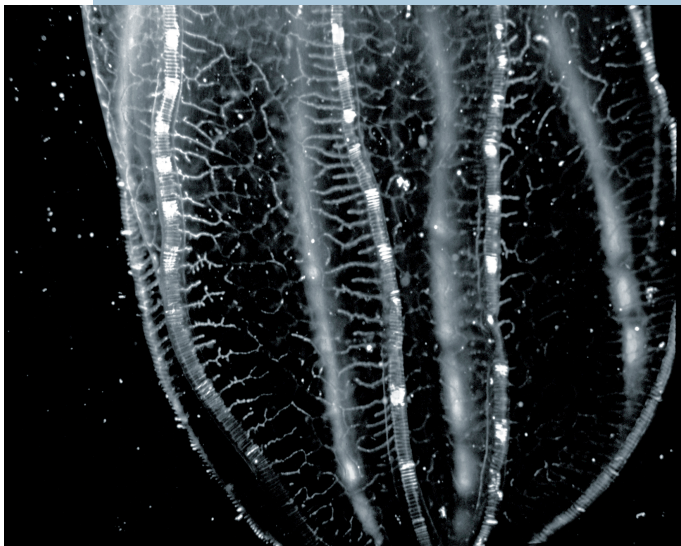


photo by Matt Gilligan



species of seaweeds have been identified as living within Gray's Reef National Marine Sanctuary. Some of the plants are indigenous. During the winter, this live bottom community is almost devoid of visible plants but starts flourishing in late spring. By July and early August, there is an abundance of seaweeds growing along the ledges, emerging through light sand cover on the flat rock surfaces behind the ledges, and growing attached to larger shell and coral fragments. Considering the small size of Gray's Reef, it has a rich flora. New studies may be needed at the sanctuary to determine the contributions of seaweed to the animal populations which depend on them as food and habitat.

Invertebrates

The invertebrates that inhabit the exposed rock surfaces and sandy areas of Gray's Reef include bryozoans (moss animals), hydroids, ascidians (sea squirts), barnacles, tube worms, sponges, hard corals, and gorgonians (sea whips and sea fans). They form an attached "carpet" of marine life that provides refuges and habitat spaces for the mobile residents of the reef. Mobile invertebrates include sea urchins, sea cucumbers, brittle stars, sea stars, snails and other mollusks, crabs, lobsters, shrimps, and worms. Nearby sandy habitats support a different sort of bottom-dwelling invertebrate community such as sea pens, sea pansies, sea cucumbers, sea biscuits, worms, mollusks, and crustaceans which are adapted to life in soft sediments.

Since the sanctuary lies in a transition zone between temperate and tropical waters, it hosts species that appear to be surviving at the edge of their geographic range. Many invertebrates appear to be at their northern distribution limits including a particularly diverse collection of sponges. The size of many of the sponges present suggests that they are able to survive as year-round residents. New evidence on the growth rates of tropical sponges indicates that some of the larger colonies may be 15-20 years old. This same situation exists for a number of hard and soft corals at Gray's Reef, many of which are surviving year-round at the northern limit of their range.



photo by Gray's Reef

photo by Gray's Reef

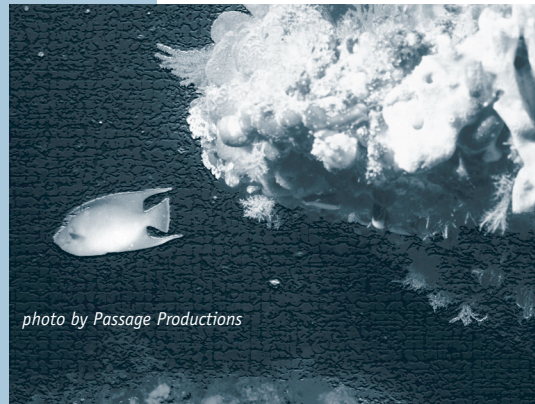


photo by Passage Productions

Gray's Reef National Marine Sanctuary also serves as a southern geographic limit to many northern, or temperate species. Many cold water invertebrates found on Gray's Reef have not been observed off the coasts of southern Georgia and Florida. The unique combination of both tropical and temperate species present in the



photo by Gray's Reef



photo by Karen Angle



photo by Karen Angle

sanctuary makes for a diverse community of invertebrates that can be found nowhere else in the world except the hard bottom reefs of the southeast.

The invertebrates of Gray's Reef are among the richest in the region, both in terms of diversity and total abundance (or biomass). While the community is considered to be thriving and generally healthy, a recent study has been initiated to examine the levels of potentially toxic substances in some of the bivalve mollusks of the reef. Along with the water quality measurements, this information should provide a baseline to measure changes in contaminant levels in the future.

Sea turtles

The reef structure and invertebrate communities at Gray's Reef attract an array of large vertebrates, one of which is the threatened loggerhead sea turtle. Loggerheads are frequently sighted at Gray's Reef at the surface and underwater swimming over ridge tops, across sand flats, and under ledges. The turtles are attracted to an abundance of their preferred food, such as mollusks, whelks, crabs, and jellyfish. Gray's Reef scientists have been tracking the movements of loggerhead turtles at the reef using satellite telemetry tags. Scientific divers capture individual turtles to attach satellite tags to their shells to track their movements and record their dive frequencies and depths. This information adds to the sparse data-base about the open ocean habits of these marine reptiles. The studies are showing that Gray's Reef is an important area for loggerheads to rest and forage throughout the year, and especially during the summer nesting season when females may nest two to four times laying approximately 120 eggs per nest on area beaches.

Dolphins / Whales

Spotted and bottlenose dolphins are the most often encountered marine mammals at Gray's Reef. The endangered northern right whale is also observed in the vicinity in the winter. Gray's Reef lies in close proximity to the region designated as critical habitat for right whales whose only known calving grounds are coastal Georgia and northern Florida.

Sea birds



photo by Digital Stock

Sea birds seen in the Gray's Reef area include petrels, shearwaters, gannets, phalaropes, jaegers, and terns. Many are seasonal migratory species. The biological interaction between feeding seabirds, baitfish (surface schools of herring or scad), and pelagic predators (mackerels and tunas) is particularly evident in the vicinity of reefs.

Fishes

Of the estimated 20,000 species of fishes living on the earth today, about 60 percent are marine and most of these inhabit the continental shelves of warm seas. It is likely that there are over 300 exclusively marine fish species in Georgia's coastal, inner-shelf, and midshelf areas. Roughly one-third of these are considered reef fishes and many others are indirectly associated with reefs. The estimated 150 species of fishes recorded at Gray's Reef encompass a wide variety of sizes, forms, and ecological roles. Often, the designation of species as a 'reef fish' is unclear because species vary widely in their degree of association with reefs and hard bottoms. The managed complex of reef fish includes over 70 diverse species, consisting of snappers, groupers, porgies, grunts, and other families of fishes, some with complex life history patterns that make them more easily subjected to overfishing. Reefs like Gray's Reef support a mixed assemblage of reef fish including red porgy, vermilion and red snapper, black sea bass and gag grouper.

Some fish species are totally dependent upon the reef for food and cover, rarely venturing away from it during their life. Examples include angelfishes, damselfishes, and sedentary reef dwellers such as the soapfish, blennies and gobies. Though most are active during the day, many are nocturnal, seeking refuge within the structure of the reef during the day and emerging at night to feed. These include bigeyes, cardinalfishes, squirrelfishes, and morays. Some species of reef resident fish disperse to other reef areas north and south for feeding and spawning; other reef residents, such as gag grouper and black sea bass, rely on the inshore areas and estuaries in early life stages.

Some pelagic (open-water rather than bottom-dwelling) species aggregate near reefs in search of prey. These include jacks, mackerels, bluefish, cobia, and barracuda. Many gobies, some wrasses, basses, and porgies inhabit the sand near reefs. Finally, some species live in or on other species. Examples include the pearlfish which lives in a sea cucumber, the sharksucker and the pilotfish, that 'hitch rides' on large animals and the silver driftfish, which lives in association with jellyfish.



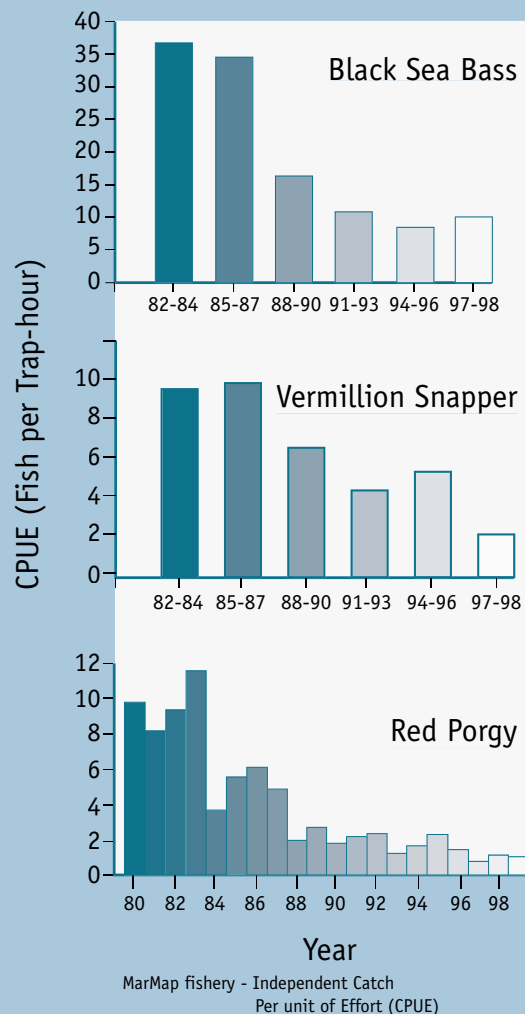
photo by Matt Gilligan



photo by Gray's Reef

Southeast Reef Fish Status

- regional trends in decline
- traditional fishery management practices may not work
- Gray's Reef provides no significant additional protection to fish resources



NOAA's National Marine Fisheries Service notes in its 1999 report, entitled "Our Living Oceans," that many key fish species in the Atlantic are overutilized including, vermilion and other snappers, red porgy, several grouper, and jewfish. Black sea bass, which are common at Gray's Reef, are considered approaching full utilization. As the report notes, some reef fish such as groupers are vulnerable to overfishing simply as a result of their life histories. For example, some fish species grow slowly, change sex, are easily captured, have a large body size, and delay reproduction. Eight of the ten major species in the Atlantic headboat fishery show significant declines in size of fish caught since 1972.

Given the complexities of multi-species interactions in fish assemblages, plus the added effect of their varying life history characteristics such as long-lived sex changing species versus short-lived fast growing species, the South Atlantic Fishery Management Council suggests that traditional fisheries management practices need to be supplemented by the establishment of marine reserves. More specifically, the reasons for concern about the snapper-grouper complex are:

- The snapper grouper fishery is a multi-species fishery and single-species management measures may not always work. When management measures, such as zero harvest, are implemented for some species, there is inevitably incidental catch of these species among the catch of other reef fish. These unavoidable consequences of single species directed management measures may delay recovery of overfished stocks. In addition, measures such as minimum sizes and quotas for individual species, do not achieve their intended impact if large quantities of fish continue to be caught and killed in a mixed species fishery.
- Several species in the grouper complex have life histories that may make them susceptible to being overfished. For example, certain species change sex at some point in their life so that older, larger individuals are predominantly of one sex. When fish stocks are heavily fished and/or depleted, changes may occur to the ratio of males to females in the population which could effect reproductive potential of the stock. Larger individuals in the grouper population are typically male. Traditional fishery management focuses fishing effort on larger individuals as a species declines, intensifying relative effort on the males and largest, most productive females. Many of these species also aggregate to spawn, making them vulnerable to overfishing.
- Fish produce eggs in proportion to their body size. A red snapper that is 24 inches long theoretically can produce as many eggs as 212 red snappers that are 17 inches long. Traditional fishery management plans use minimum sizes, which allow fish to mature and spawn one or more times before being caught. However, this practice can result in removing

- since 1981 research has been conducted to monitor reef fish
- low diversity of captured fish at Gray's Reef

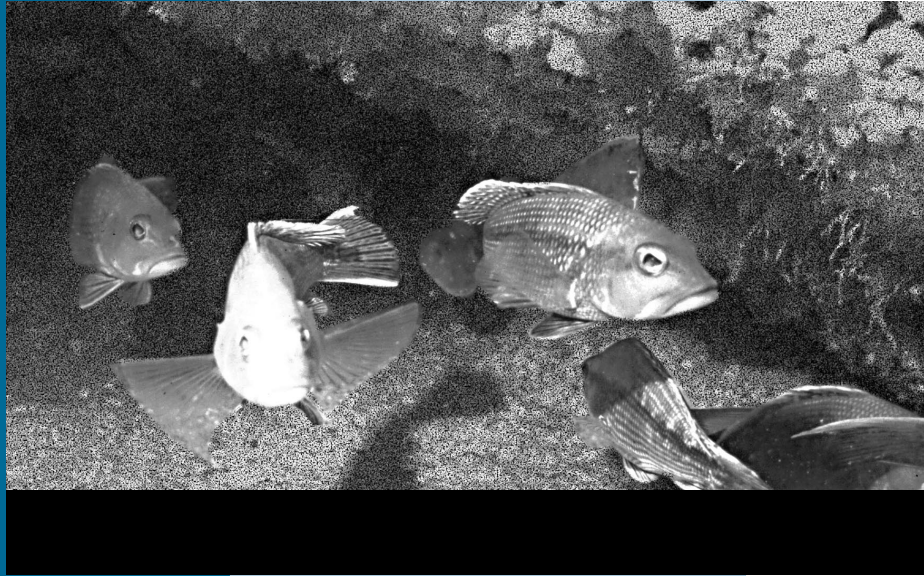


photo by Gray's Reef



photo by Gray's Reef

the biggest individuals from the population and thus removing the fish that are producing more eggs.

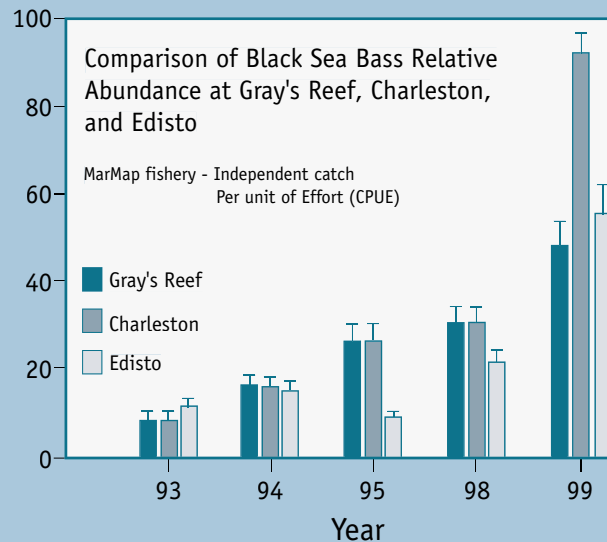
Coastal Pelagic Fisheries

Coastal pelagic fishes inhabiting waters off the southeastern United States include king and Spanish mackerel, cero, dolphinfish and cobia. These species range in coastal and continental shelf waters from the northeastern United States through the Gulf of Mexico and the Caribbean Sea and as far south as Brazil. Coastal pelagics are fast swimmers that school and feed voraciously, grow rapidly, mature early and spawn over many months. At Gray's Reef king mackerel is the primary coastal pelagic sought by recreational anglers. NOAA's National Marine Fisheries Service notes that the Atlantic king mackerel stock is near its long term potential yield. Catches have remained stable since 1981 with total allowable catches not reached in most years.

Reef Fish Status at the Sanctuary

Since Gray's Reef was designated a National Marine Sanctuary in 1981 there have been repeated studies to characterize and monitor reef fish populations. Methods, such as visual surveys by divers, video surveys, and trapping studies, have all contributed to the understanding of the status of reef fish stocks at Gray's Reef. The most intensive and rigorous effort to monitor reef fish populations at the sanctuary was initiated in 1993 through the National Marine Fisheries Service's Marine Resources Monitoring Assessment and Prediction (MARMAP) program. Through the MARMAP program, reef fishes are captured in traps at the sanctuary, identified, measured, tagged and released to provide estimates of the total population size, average length and the average number of fish caught per trap deployment.

At Gray's Reef, black sea bass is the main species trapped. This species, like many in the snapper grouper complex, is resident on reefs and other structures as adults. Black sea bass are estuarine dependent as juveniles, and are sequential hermaphrodites, although relatively little is known about spawning behaviors on or near Gray's Reef. The tagging results found that 93 percent of the fish that were recaptured at least a month or more after being tagged remained in the sanctuary. Even with such low rates of movement, the study estimates that as many as 33,000



more research here than any comparable area off GA coast

long history of study

new commitment to research with budget increase

tradition of innovative education

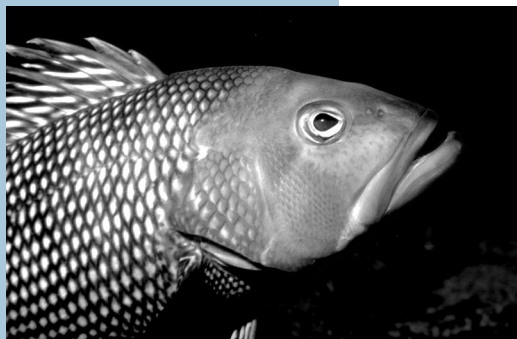


photo by Karen Roeder

fish may move out of Gray's Reef over the period of few months. The scientists conclude that if fewer fish were taken at Gray's Reef that the sanctuary would serve as a source of black sea bass for other reef areas in the region. Since 1993 the study has shown a fairly steady increase in the number of black sea bass in the sanctuary; the mean length of black sea bass collected in 1999 was greater than any other period except the summer of 1994. However, for any given year the length of black sea bass at the sanctuary was generally smaller than the mean length of black sea bass sampled at similar non-protected, commercially fished live bottom reef areas in the southeast.

The study also found that the diversity of fish caught in the traps was lower at Gray's Reef than at two of the three comparison reefs. Overall while there are encouraging signs for increase in the number of black sea bass at the sanctuary, this trend is mirrored at other reef sites. The authors conclude that "...the fish community and dominant economically valuable species (black sea bass) at Gray's Reef National Marine Sanctuary show the same signs of overfishing that are prevalent on live-bottom reefs throughout the South Atlantic Bight." Whereas black sea bass remain rather common, other species of reef fish expected in habitats like Gray's Reef are trapped there only rarely. This result is likely related both to the regional depletion of those species, and the timing and structure of the trapping program.

Gray's Reef has supplemented the MARMAP studies with SCUBA diver visual counts of the reef fish populations in the sanctuary. Since 1995 divers have counted over 80,000 fish and 56 different species at Gray's Reef. The data were collected using a standard, non-destructive visual method developed by NOAA scientist Dr. Jim Bohnsack. Divers stationed at each of 22 different permanently marked sites, count all fish observed for five minutes within a circular plot. The sample radius varies with visibility but averages 12 to 15 feet. The various species are then ranked according to how often they were observed. These monitoring data provide an excellent representation of the variety of reef fish at the reef, show seasonal trends, and can provide a warning if reef fish abundance patterns change dramatically. However, the data reflects the current conditions with fishing effort; there is no baseline available to indicate what the fish populations and diversity once were at Gray's Reef. Dr. Bohnsack has conducted counts at Gray's Reef and notes that while the variety of species at the reef seems to indicate a

diverse assemblage of reef fish, he is concerned by an absence of larger individuals and species from the counts. Dr. Bohnsack concurs with the conclusions of the MARMAP report that reef fish species and numbers at Gray's Reef do not appear significantly different from other fished live bottom reefs off the southeastern U.S.

Resource Pressures are Increasing

The South Atlantic Fishery Management Council has recently highlighted the concern that the number of people fishing and their ability to capture fish, particularly reef fish, is exceeding the capacity of some species to sustain themselves. They note that "the worldwide demand for fish has increased dramatically in the last several decades, primarily because of overpopulation but also because of per-capita increases in consumption. In addition, an increased ability to locate and capture fish, both recreationally and commercially, through advances in fishing technology (GPS, loran and electronic fish finders) has increased fishing pressure. Coastal growth with the advent of better navigational electronics, more fuel efficient engines, more income such that more and more people can afford bigger boats and go farther offshore, have made reef fishes everywhere more accessible to fishing pressure."

Gray's Reef National Marine Sanctuary is near one of the more rapidly developing regions along the US coast. At the time Gray's Reef was designated as a marine sanctuary in 1981, the population of the six Georgia coastal counties bordering the Atlantic Ocean (Camden, Glynn, McIntosh, Liberty, Bryan and Chatham) was 326,382. By 1990 that figure had risen to 386,415. Projected estimates of population for 2000 and 2010 are 467,834 and 548,896 respectively. While these figures show sizable increases projected for the coastal counties of Georgia it is also important to recognize that a significant number of the visitors to the sanctuary come from counties further inland or from nearby South Carolina and Florida. According to the Bureau of Census 25 counties of the coastal plain of Georgia contained almost 800,000 people in 1999. The population in these counties is expected to grow by 18 percent to more than 942,000 by 2015. The trends toward increased populations in the coastal region have begun to place a burden on our natural and economic resources that were once perceived to be available in abundance.

The increase in coastal population has been reflected in the increase in visitation to the sanctuary. In 1983, the sanctuary began conducting a year-long survey to count the number of vessels visiting the sanctuary. Using fixed-wing aircraft to fly over the sanctuary, there were a total of 106 vessels sighted visiting Gray's Reef during 62 flights over the course of the year. The highest daily sighting

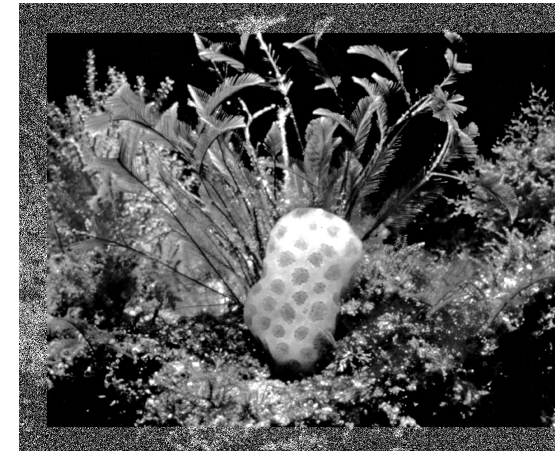


photo by Gray's Reef

- *increase in number of boats going offshore*
- *technology improvements in catching fish*
- *more recreation / leisure time*



photo by Gray's Reef

was 14 boats during the Sapelo Open Kingfish tournament. Today, the U.S. Coast Guard Auxiliary flies routine surveys over the sanctuary, usually three times a week. In 1999, a total of 527 boats were observed in the sanctuary during 90 overflights with a maximum of 77 boats spotted during one flight, also during the Sapelo Open Kingfish tournament. The average number of boats sighted per flight during the 1983 survey was 1.7. During the same period beginning in 1998, that number had increased to 7.3. Clearly the level of fishing and diving has increased substantially since the early years of the sanctuary. The pressure this level of activity places on the resources of Gray's Reef will need to be explored as the sanctuary management plan is reviewed.

As coastal population increases, it's also important to recognize that many factors besides fishing activities can adversely affect the health of live bottom habitat offshore like Gray's Reef. The South Atlantic Fishery Management Council has prepared a Habitat Plan to help protect essential fish habitat in the South Atlantic region. The Council classifies non-fishing threats into two categories:

Threats to Estuarine Processes: such as agriculture, aquaculture, silvaculture, urban/suburban development, commercial and industrial activities, navigation, recreational boating, mining, hydrologic modifications, and natural events and global change; and *Threats to Offshore Processes:* which include navigation, dumping, offshore sand and gravel mining, oil and gas activities, commercial and industrial activities, and natural and global change.

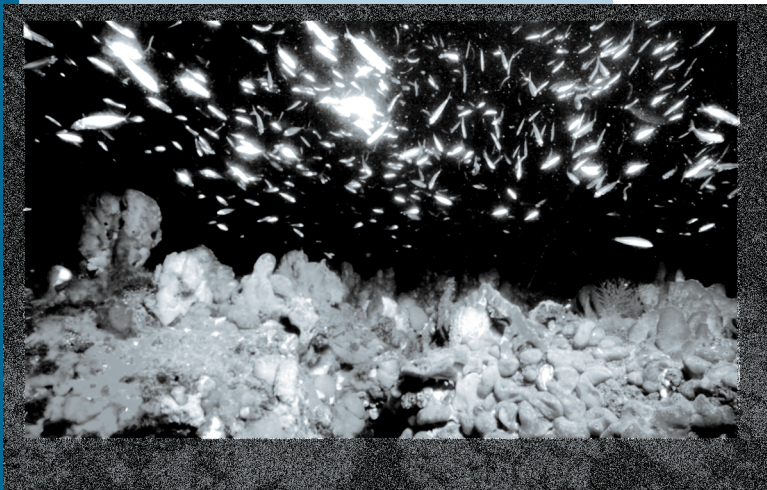


photo by Karen Angle

Gray's Reef, as a relatively nearshore marine habitat, can be affected by alterations to the adjacent estuarine environments as well as offshore activities. Through the authorities of the Marine Sanctuary Act, and the Magnuson-Stevens Act in the case of fishery resources, federal agencies conducting or permitting activities outside the boundaries of the sanctuary that are likely to affect sanctuary resources must first consult with the Secretary of Commerce. Throughout the coastal zone, the State of Georgia protects and manages its natural resources through the Georgia Coastal Management Act. The sanctuary in partnership with the State works to minimize these threats to estuarine and offshore processes through the Marine Sanctuary Act, the Coastal Zone Management Act, and other natural resource oriented legislation.

Issue Identification



photo by Karen Angle

Management Plan offers opportunity to better protection

Good suggestions from Scoping

Sanctuary Advisory Council recommendations

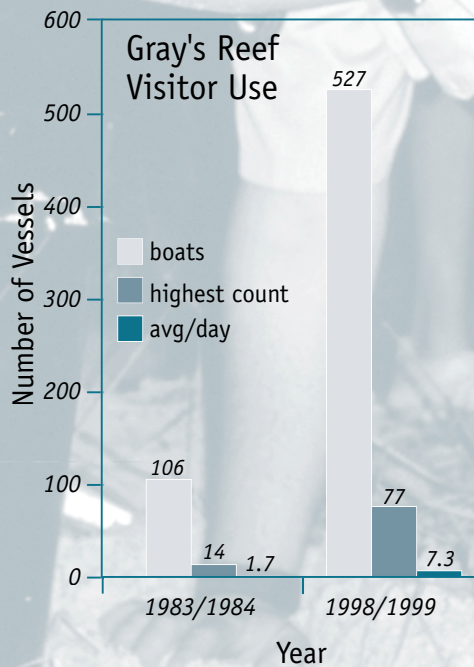
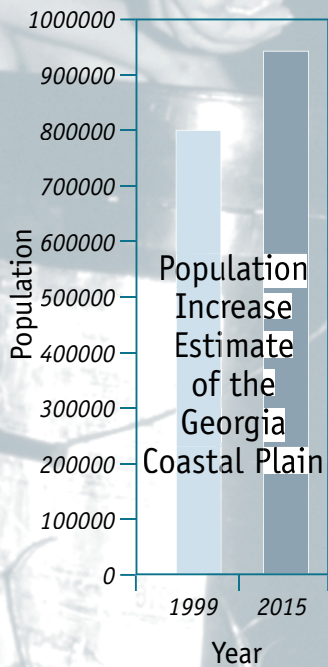
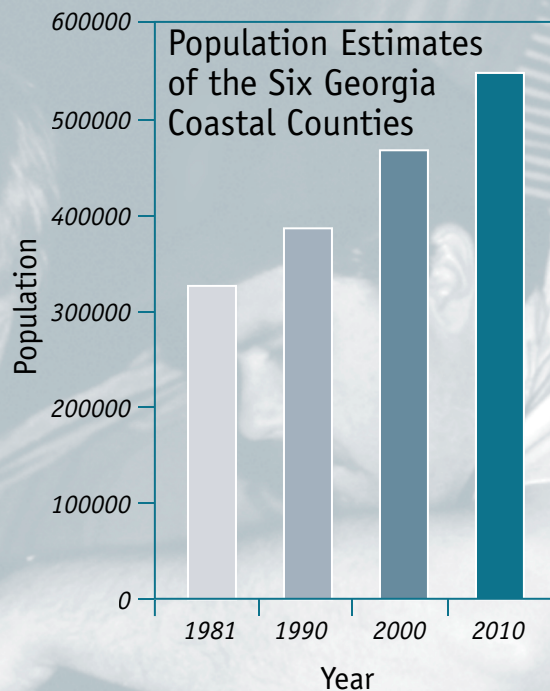


photo by Gray's Reef

The Gray's Reef National Marine Sanctuary initiated the process of reviewing its existing management plan in December 1999 and January 2000 with a series of meetings designed to ask the public for their views on necessary changes to the research, education and conservation agenda for Gray's Reef. During the comment period approximately 1800 people participated to express concerns and provide recommendations.

Comments ranged widely among the participants. Many provided views on possible changes to sanctuary management that they felt would enhance conservation of Gray's Reef resources while others suggested that no changes to existing rules were necessary. Below are some of the key issues raised to improve conservation at the sanctuary.

- Anchoring restrictions - to minimize damage to the ledges and live bottom habitat a no-anchoring provision has been suggested. Others suggest a ban on anchoring may not be warranted given the limited bottom fishing at Gray's Reef.
- Mooring buoys - to provide locations in the sanctuary to tie off vessels in place of anchoring. Concerns have been expressed about where to locate mooring buoys and the effect of concentrating activity in particular areas of the sanctuary.
- Spearfishing restriction - to protect the largest and most vulnerable reef fish species. This was an issue during the original designation. Presently only the use of powerheads is prohibited. Some argue spearfishing is one of the most efficient fishing methods with minimal bycatch or taking of undersized fish.
- Bottom fishing restriction - to provide additional protection to reef fish species. Since most of the fishing is for migratory pelagic fish like mackerel some have suggested that a restriction on bottom fishing which targets the more vulnerable reef dependent species would improve conservation at the sanctuary. Such restrictions could be difficult to enforce and others feel the stress on reef fish resources at Gray's Reef is not sufficient to warrant such restriction.
- Recreational fishing regulations only - to restrict the number and size of fish any individual could take from the sanctuary. Although there is thought to be little commercial fishing currently underway at Gray's Reef, some argue that conservation would be enhanced if fishing was only permitted under the rules that govern recreational fishing. Eliminating Gray's Reef from use for commercial take would restrict the use of certain fish gear and limit the number and sizes of fish an individual could harvest.
- Research Reef designation - to provide a scientific control area within the sanctuary



for research purposes. Gray's Reef currently uses one particular ledge feature as a focus for reef fish and invertebrate community monitoring. Some have suggested that that feature be identified and that a voluntary or mandatory no fishing designation of that ledge be adopted to give scientists a control area to study. Others argue that such restrictions are unnecessary and question the scientific value of setting such an area aside.

- **Artificial Reefs** - to provide additional habitat within the sanctuary for recreational fishing and/or research. During the scoping meetings held by the sanctuary many participants pointed to the need for additional structure on the ocean bottom off Georgia as habitat for reef fish. There is significant scientific debate about the effects of artificial reefs on natural reef fish ecology. South Carolina, Georgia and Florida have active artificial reef programs. The appropriate role of the sanctuary and artificial reefs should be explored.

What's Next?

The staff of Gray's Reef would like to meet with organizations and groups interested in the future of the sanctuary to build upon many of the recommendations and comments provided during the comment period. With this report as a starting point it is our hope that continued interest and involvement by the public will help shape the directions to be taken in the review of the sanctuary management plan. Following these meetings we plan to convene technical and issue oriented workshops in early December 2000. The results of these workshops will provide additional guidance for the development of the draft plan which is planned for publication in the spring of 2001. Ultimately we hope to have a final plan issued in the fall of 2001.

In the Appendix to this report we have described briefly the ongoing programs and projects underway at Gray's Reef and the important role of the Sanctuary Advisory Council in Gray's Reef programs. We hope this will provide sufficient context to assess the general directions we are heading with the sanctuary program and provide a basis for discussion of appropriate changes in the programs we offer. Your ideas and suggestions will be used in the planning of our programs in education, research and resource protection. We are committed to the community-based process which involves public input at several points. We hope you will continue to be involved.



photo by Karen Angle

In 1972, exactly one hundred years after the first national park was created, the nation made a similar commitment to preserving its marine treasures by establishing the National Marine Sanctuary Program. Since then, thirteen national marine sanctuaries, representing a wide variety of ocean environments, have been designated. These sanctuaries are shown on the map bottom right.

photo by Passage Productions



photo by Gray's Reef



photo by Gray's Reef

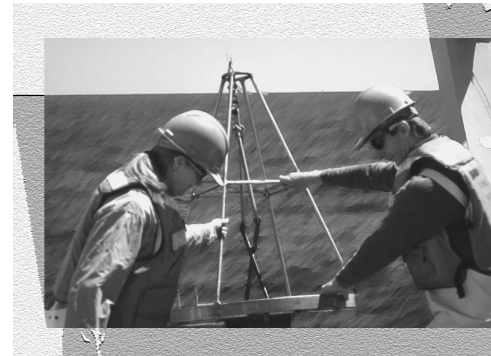
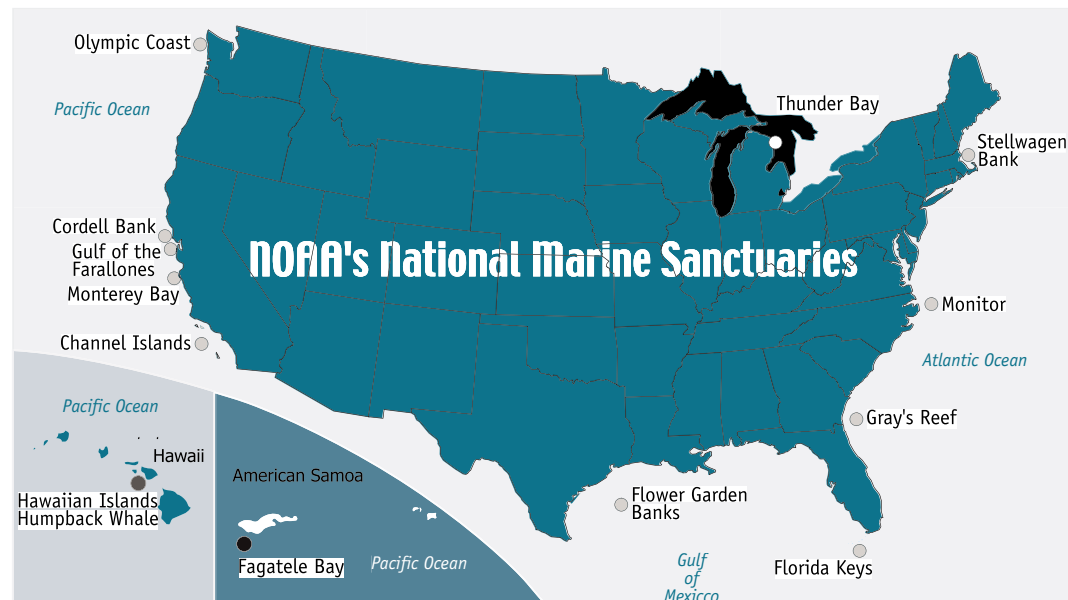
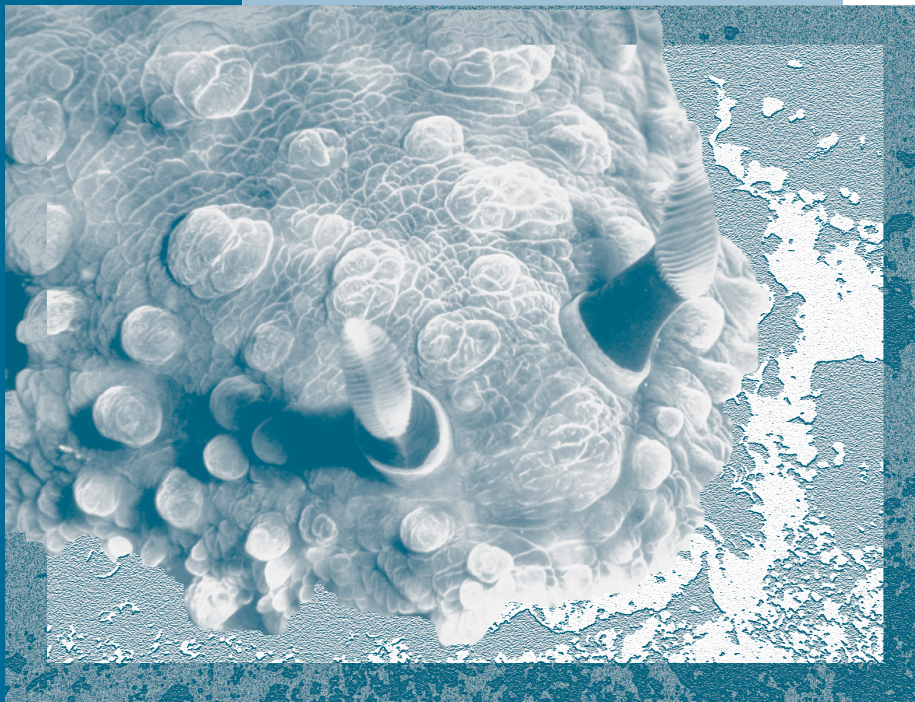
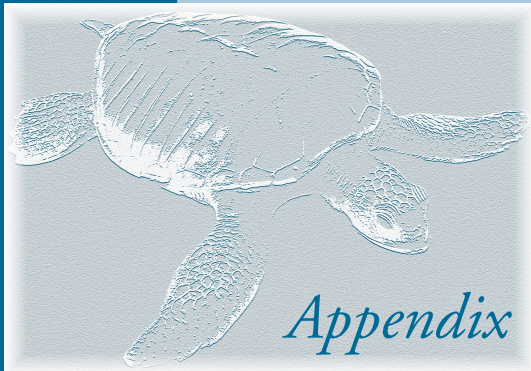


photo by Gray's Reef





Current Research, Education and Resource Protection at Gray's Reef

In accord with the current management plan for the Sanctuary, Gray's Reef has many research, education and resource protection programs underway. Many of these programs are described in greater detail in the Gray's Reef web page at www.graysreef.nos.noaa.gov

We invite you to explore our webpage and become familiar with our current activities at the sanctuary. The listing below highlights briefly some of our projects and programs over the last decade that may be of interest. All the research, education, and resource protection programs of the sanctuary will be assessed during the workshops and in development of the draft and final management plans.

Research and Monitoring

Marine Assessment Monitoring and Prediction(MARMAP)
The MARMAP program funded by NOAA has been studying reef fish populations in the region for close to 30 years. Sampling in Gray's Reef began in 1993. Reef fish are captured in traps to determine species composition and length frequency, to compare catch-per-unit-effort at Gray's Reef with results from similar habitats and to tag fishes to estimate population abundance and detect movements.

Visual Reef Fish Assessments

In 1995, Gray's Reef initiated a reef fish monitoring effort to supplement the MARMAP program. Divers swim to 22 different stations at the reef and visually count and identify the fish species at different times of the year. This study provides a more complete picture of the variety of species at the reef than the MARMAP trapping project can provide. Divers at the reef have counted over 80,000 fish of 56 different species.

Habitat Assessment

Gray's Reef recently initiated a more comprehensive study of the sanctuary habitat through NOAA's National Centers for Coastal Ocean Science. The centers in Beaufort, North Carolina and Charleston, South Carolina are analyzing reef fish monitoring data, examining the importance of the non-reef habitats for juvenile fish, assessing possible contaminant levels in sediments and shellfish, determining the species of fish that spawn at Gray's Reef and evaluating the movements of larval fish to and from Gray's Reef.

Seabed surveys

The bottom features have been surveyed at the sanctuary using a variety of techniques including side scan sonar and sub-bottom profiling instruments. The sanctuary is working with NOAA survey ships to plan a detailed survey of the sanctuary using the latest multibeam survey instruments. An image of the seafloor at Gray's Reef is available on the Gray's Reef webpage.

Physical Oceanographic Properties

A study of ocean current patterns at Gray's Reef has been conducted by the Skidaway Institute of Oceanography. A few years ago, NOAA deployed an ocean data buoy in the sanctuary that measures winds, waves and other meteorological and oceanographic properties. These data are available for mariners and scientists through the Gray's Reef webpage.

Over the course of many years the data from the ocean buoy will characterize the dominant trends in meteorological conditions at the sanctuary and capture the magnitude of episodic events such as hurricanes that can significantly affect the ecological balance of marine habitats. Since 1871 there may have been 11 hurricanes that passed over Gray's Reef.

Education

The sanctuary educational and interpretive programs are designed to broaden public awareness and understanding of the marine resources at Gray's Reef. Direct access to the reef itself requires experience in open-ocean diving, thus limiting the opportunity for a first-hand encounter with the sanctuary environment. For this reason, the educational programs focus on land-based interpretive themes and exhibits.

Gray's Reef National Marine Sanctuary sponsors community outreach marine programs, public seminars, presentations and exhibits. Educational curricula have been developed for the elementary and middle school level as well as high school materials that focus on the Northern Right Whale. A variety of educational posters about Gray's Reef are also available from the sanctuary. The education staff frequently conduct programs about the sanctuary locally and through the Georgia distance learning network to schools throughout the state.

Resource Protection

Protective measures adopted for Gray's Reef are enforced by the US Coast Guard. In addition to on-water patrols of the sanctuary, the Coast Guard Auxiliary conducts overflights of Gray's Reef to maintain a census of the number of vessels in the sanctuary and the levels of fishing and diving activity.

The sanctuary is planning to supplement this effort with a radar unit on a nearby Navy tower which will provide a more comprehensive assessment of the levels of visitor use at Gray's Reef. It is difficult to track visitor use in an open ocean environment. These overflights and radar unit are cost effective techniques for monitoring vessel traffic at Gray's Reef. In addition, NOAA and the Coast Guard are responsible for enforcement of fishery regulations in the region including Gray's Reef.

Education plays an important role in resource protection. Gray's Reef has established exhibits and displays at many visitor centers and museums in coastal Georgia to advance the message of marine conservation for the sanctuary. Over the next year new exhibits designed specifically for marina and boat ramp areas will be constructed to better reach the boating public and support sanctuary resource protection.

Sanctuary Advisory Council

The Sanctuary Advisory Council (SAC) serves as a forum for consultation and deliberation for the community and as a source of consensus-based advice to the sanctuary. This is a community-based participatory process that assures continued public input to management decision-making, while at the same time expanding public awareness about the sanctuary and challenging marine resource management issues. Specifically, the SAC's objectives are to provide the sanctuary manager with advice on:

- Protecting natural and cultural resources, and identifying and evaluating emergent or critical issues involving sanctuary use or resources;
- Identifying and supporting the sanctuary's research objectives;
- Identifying and supporting educational opportunities to increase the public knowledge and stewardship of the sanctuary environment;
- Assisting to develop an informed constituency to increase awareness and understanding of the purpose and value of the sanctuary and the National Marine Sanctuary Program.

Each Council member represents an important element of the sanctuary mission whether it is research, education, conservation or user groups

- **Dr. V. James Henry**, Council Chair, Georgia Southern University, Non-living Marine Resources Research Representative
- **Dr. Matthew Gilligan**, Council Vice-Chair, Savannah State University, University Education Representative
- **Ms. Patty McIntosh**, Council Secretary, The Georgia Conservancy, Georgia Conservation Representative
- **Ms. Anne Lindsay Frick**, University of Georgia, K-12 Education Representative
- **Ms. Judy Wright**, Island Dive Center, Sport Diving Representative
- **Dr. George Sedberry**, South Carolina Marine Resources Research Institute, Living Marine Resources Research Representative
- **Mr. William (Bing) Phillips**, Coastal Conservation Association of Georgia, Sport Fishing Representative
- **Dr. Douglas Rader**, Environmental Defense, Regional Conservation Representative
- **Mr. Henry Ansley**, Georgia Department of Natural Resources, Coastal Resources Division, Marine Fisheries Section Representative
- **Mr. Joe Kimmel**, NOAA National Marine Fisheries Service, Southeast Regional Office Representative
- **LCDR David A. Cinalli**, U.S. Coast Guard, Seventh Coast Guard District Representative

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